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The Development of Economic Statistics II Module Based on Problem-Based Learning (PBL) in Nusantara PGRI University, Kediri

Bayu Surindra[1*] Bakti Widyaningrum[1] Zulistiani[2]
1.Economic Education Department, Nusantara PGRI University. Ahmad Dahlan Street, Kediri 64112, East Java, Indonesia
2.Management Department, Nusantara PGRI University. Ahmad Dahlan Street, Kediri 64112, East Java, Indonesia

Abstract
This research aims at: 1) Developing Economic Statistics II module based on Problem-Based Learning in Economics Education Study Program of Nusantara PGRI University, Kediri; 2) Discovering the effectiveness of the use of Problem-Based Learning-based module in the teaching and learning of statistics; 3) Improving students' learning outcome using Problem-Based Learning-based teaching and learning in Economic Statistics II course. This is a development research with mixed data analysis method. Descriptive analysis is used to figure out the distribution of students' pre-test and post-test learning outcomes and the t-test comparison analysis uses SPSS as an aid to find out the module effectiveness in teaching and learning. Based on the descriptive analysis it is found that students' learning outcomes have increased from before and after using Problem-Based Learning-based Economic Statistics module. The mean students' score before using the module is 77.05 and after using the module their mean learning outcome increases to 84.00. In other words, it is proven that the use of this module can improve the students' mean learning outcome. Based on the comparison analysis results, the *paired sample test* shows that t-statistic value is 0.00 < 0.05, meaning that the Economic Statistics II Module can significantly improve students' learning outcome.
Keywords: Problem-Based Learning (PBL); Economic Statistics II Module, Students' Learning Outcome

1. Introduction

Currently, high-quality human capital becomes a necessity for every nation and the shaping of high-quality human resources is the essence of educational processes. Both formal and nonformal educations play a certain role in it. This is also in line with the objective of Indonesia's national education, i.e. creating Indonesian people holistically. Education at college requires students to keep thinking critically, innovatively and solve their problems independently. This demand, in turn, has led to the shift of education paradigm at college, one which used to be instructive and teacher-centric turns into self-directed one. In student-centered learnimg (SCL) lecturers play an active role as a motivator and evaluator who stimulate their students to achieve the main goals in educational processes, namely knowledge development (critical thinking), independence, and skills (Pedersen and Liu, 2003; Lathika, 2016; Kurdi, 2009). A type of teaching and learning with its center on students is commonly termed as *Student-Centered Learning* (SCL), meanwhile *Problem-Based Learning* (PBL) is just an application of SCL (Collins and O'Brien, 2003; Mishan, 2011; Tian et al, 2013; Looi and Seyal, 2015; Lathika, 2016).

2. Theoretical Review

2.1. *Problem-Based Learning* (PBL)

Problem-Based Learning (PBL) is a teaching and learning process directed towards problem-solving, particularly in relation to the application and materials of lesson in real life (Ginting, 2008:210). It is elaborated further by Tian (2013:14) that PBL does not end with problem-solving, it uses the solution in solving a problem to improve students understanding and knowledge. *Problem-Based Solving* itself was initially used in medical teaching and learning, and along with the PBL development, it is currently applied in the teaching and learning of many disciplines, and among these disciplines are business and economics education. Gijselaers (1995) and Stinson (1996) in Chulkov (2015:191) explain that PBL applied in business and economics education teaching and learning can enhance students' skills in solving problems related to business and economics.

PBL is at least divided into five processes: 1) Dividing students into small groups; 2) Presenting problems or cases to these groups, the cases can be from the challenges given by educators (lecturers) or the one students find themselves through observation. These cases or problems are usually presented by lecturers with graded complexity levels or varied difficultires; 3) The groups develop hypotheses based on several identified solutions to the problems which have previously been presented by each member of the groups; 4) The next stage is self-directed study where each individual completes the part of individu work assigned by lecturers. Results of this individual work is reported to the groups under the lecturer's guidance. Instructor (lecturer) in this stage plays a

facilitator role who is tasked to support, direct, emphasize and clarify to the group members; 5) The last stage in the PBL process is drawing conclusion by groups (Tian et al, 2013 and Chulkov, 2015).

In this research, Problem-Based Learning (PBL) will be given to students by integrating it to case-based learning. According to Chulkov (2015) PBL and case-based learning have fundamental differences, yet when they are integrated and applied in teaching and learning process they will make a good combination, and according to Rybarcyk et al (2007:181) case method can be included in problem-based learning (PBL). However, case-based learning and PBL share something in common where the two learning methods place lecturers as facilitators and both focus on students (student-centered learning*)*. The differences are that case method focuses on providing real-life case samples and PBL focuses on a problem, to which solutions are sought and conclusions are drawn. Grouping students is not essential in case-based learning, yet in PBL learning in groups is the most essential part.

Economic Statistics II

In our daily life, the term statistics means tables, lists, a set of numbers, diagram, or graphs about something. Statistics is a science which studies the way of collecting, processing, presenting, and analyzing data as well as drawing conclusion based on the data in the form of numbers (Wahyuni, 2011: 1). In relation to research, statistics is only used as a tool for research of quantitative nature, because statistics can only work using numbers. When it is related to economics, statistics is also mostly used in data analysis in the form of numbers.

Economic Statistics II is one course students should take after they completed Economic Statistics I course. In Economic Statistics II the learning materials are more complex and require various kinds of analysis in solving the problems encountered. *Problem-Based Learning* (PBL) with integrated case study will be given in Economic Statistics II course. This Economic Statistics II course is one of important courses for students. Through this course, students will learn how to analyze data which begins with data collection, data grouping, data processing, to the technic to analyze the available data because different data need different analysis technique.

A teaching and learning process will always be connected to the expected end ability or *learning outcomes* (LOs) because a teaching and learning process will not be said to have been successful when it fails to meet the predetermined LO criteria. In this research, LO becomes the main concern because not all LOs will be treated using this method. In Economic Statistics II course during one semester students are expected to have six end abilities, namely: 1) Capable of understanding what Population and Sample are; 2) Capable of analyzing and demonstrating data collection instrument test; 3) Capable of analyzing and demonstrating descriptive hypothesis; 4) Capable of analyzing and demonstrating comparative hypothesis; 5) Capable of analyzing and demonstrating associative hypothesis; 6) Capable of analyzing and demonstrating regression; 7) Capable of analyzing and demonstrating path analysis.

2.2. Economic Statistics II Module

In teaching and learning process, module is a highly important teaching material. Module is a means of learning in a written or printed form which is prepared systematically, containing learning materials, the method and objectives of teaching and learning process beased on basic competence or competence achievement indicator, self-learning activity instruction (*self-instructional*), and giving students a chance to test themselves through exercises presented in the module (Hamdani, 2011: 220). Module is one print-based teaching material form designed for students to learn independently, therefore module is equipped with the instructions for self-learning (Leonda, 2015). In this case students are expected to be able to perform the learning activity by themselves without their lecturers direct teaching.

Just like other teaching materials, module should be prepared by considering many principles which will enable the module to fulfill the goals it is prepared for. The principles it should consider (Hamdani, 2011, 221) include: 1) It should be prepared from easy one to understand the more difficult one, and from the concrete one to understand the semiconcrete and abstract ones; 2) It emphasizes on repetition to strengthen students' understanding; 3) Positive feedback will give reinforcement to students; 4) Motivating is one the efforts which can determine successful learning; and 5) Exercises and assignments are meant to test the students themselves. From the principles above, a well-developed module will have positive impact on students' understanding, since thanks to such a module students are expected to understand more easily the learning materials, in this case Economic Statistics II.

3. Type of Research

This development of Economic Statistics II Module based on *Problem-Based Learning* is *Research and Development*. Research and development is a research method employed to generate certain products, and to test the effectiveness of these products (Sugiyono, 2010).

4. Research Subject

This research is conducted in class of Economic Statistics II course at Economics Education Study Program, Faculty of Teacher Training and Education, Nusantara PGRI University, Kediri. The research is conducted in a class consisting of 45 students. In this research, the researcher acts as the lecturer of Economic Statistics II course.

5. Planning Stage of Development Research

The research implemented in economic statistics II use development model from Dick and Carey with ten stage of development, which: a) Identify instructionals goals; b) Identify entry behaviours, characteristics; c) Writer performance objective; d) Develop criterian reference test item; e) Develop instructional strategy; f) develop and select instructional materials; g) Develop and conduct formative eveluation; h) Design and conduct summative eveluation; i) Instructional revitions. Development research prosedure can be seen on figure bellow:

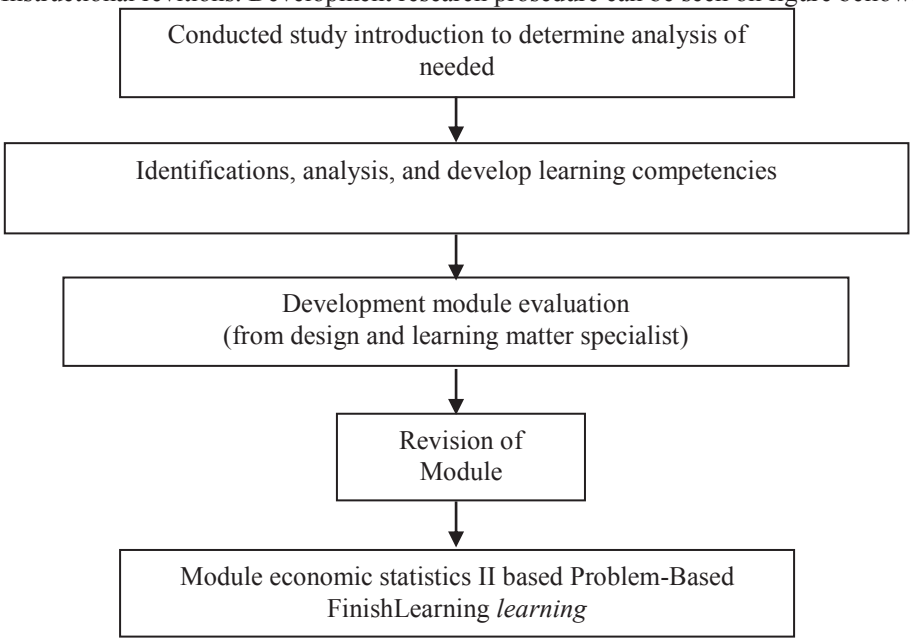

Figure 1. Economic Statistics II Module Development Procedure

6. Data Collection Technique

The research is conducted in four phases namely: planning, execution, observation, and reflection. As explained earlier, the teaching and learning process in this research consists of four phases, namely: 1) Planning, in this phase the learning and research instruments are prepared, including RPS, RPP, teaching materials, Student Discussion Sheet (LDS), teaching aid and assessment; 2) Execution, in this phase the treatment is given in the classroom; 3) Observation, observation is done by the lecturer when students complete the challenge or assignments given by the lecturer. The observation is done in reference to the observation sheet made during the planning phase. The points of consideration in the observation process is the preparedness in attending the teaching and learning process, the attention paid in attending the teaching and learning process, appreciation of group members' opinions, activeness in expressing opinions and group cooperation. The observation sheet uses closed questionnaire with *Likert* scale at 4 score gradation from very high of 4 points to very low of 1 point; 4) Reflection is the activity of drawing conclusion from the teaching and learning process done.

7. Data Analysis Technique

The data in this research are analyzed using two analysis methods namely: Descriptive analysis, it is used to compare students' learning outcomes before and after the method is applied and interpretation of observation sheet; 2) *analsis data validitas modul* Difference test or comparison (*Paired T-Test*) using SPSS to learn whether or not the difference before and after application is significant

7.1 Validity Data Analysis for Module

Economic Statistics II development module done with the formula:

$$P = \frac{\sum xi}{\sum x} \; x\, 100\%$$

Where; P: Precentage of assesment $\sum xi$: Subject total answer, $\sum x$: Total highest answer
An obtaained data then transformated into table to describe the result, range of qualitative precentages can seen on table bellow:

Table 1. Decision Making of Development Revision

Learning Outcomes	Qualifications	Information
81 – 100 %	Very Good	Revison not needed
61 – 80 %	Good	Revison not needed
41 – 60 %	Undecided	Revision
21 – 40 %	Not Good	Revision
0 – 20 %	Very Not Good	Revision

7.2 Data Analysis of questionnaire

The survey data analysis must be validity and reliability test first, it use microsoft excel and SPSS 20 help for doing an analysis each score from students. Validity and reliability are applied in class without module based on problem-based learning treatment with consideration: a) students have followed by same economic statistics II lecture and lecturer; b) similiarity of students ability. Total quesionnaire are 15 point and followed by small scale students (25 colage students), and the result of validity and reliability test can be seen on the table below:

Table 2. Decision Making of Development Revision Questionaire

Aspect	Total Item	Validity Test Decision	
		Valid	Invalid
Content	4	4	0
Language	4	4	0
Presentation	7	6	1
Total	15	14	1

Table 3. Validity Test Result

Aspect	Reliability Indeks	Decision
Content	0,732	High
Language	0,666	Midlle
Presentation	0,707	High

7.3. Learning Analysis Result Test

Learning analysis result test used to get effective and eligible data from ecoomic statistics II module base on problem-based learning. The question must be done from reliability and validity test before it used to research. Analysis done by product moment test and microsoft office excel with the result:

Table 4 Level Of Difficulty Test

Criteria	Number of Difficulty Item	Total Test
Hard	0	0
Midle	8,10,11,23,19,21,33,39,40	9
Easy	1,2,3,4,5,6,7,9,12,14,15,16,17,18,20,22,23,24,25,26,27,28,29, 30,31,32,34,35,36,37,38	31

Table 5. “Daya Pembeda” Test Result

Criteria	Number of Itmen	Total
Very Bad	0	0
Bad	0	0
Midle	0	0
Good	1 till 40	40
Very Good	0	0

Table 6. Validity Test Result

Criteria	Number Item	Total Item
Valid	All of number except	37
Invalid	7,6,34 7, 16, 34	3

8. Result and Discussion

After the teaching and learning process is done according to the procedure, the following results or findings are obtained:

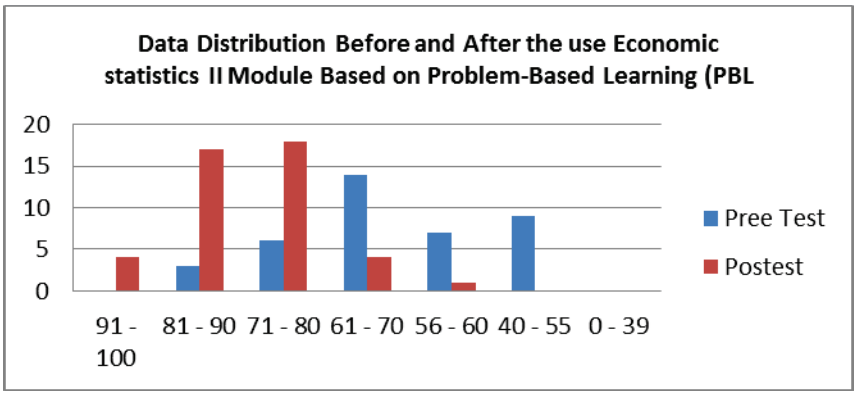

Figure 2. Students Learning Outcome Before and After Using the Module

In the graph above, the score distribution of students' pre-test and post-test can be seen. In the pre-test, no students have scores at 91-100 interval, and 4 students have scores at 91-100 interval in the post-test. 3 students have scores at 81-90 interval in the pre-test, and the number of students scoring at this interval increases significantly to 17 students in the post-test. Scores at 71-80 interval are obtained by 6 students in the pre-test and in the post-test the number increases to 18 students. The 61-70 score interval is obtained by 14 students in the pre-test and in the post-test the number decreases drastically to only 4 students. Seven students have scores at 56-60 interval in the pre-test and only one student has score at the interval in the post-test. There are 9 students scoring at 40-55 interval in the pre-test and in the post-test there is no student scoring at the interval.

The descriptive analysis in this research is used merely to learn the score distribution before and after treatment. Meanwhile to figure out the mean, correlation and comparison before and after treatment a T-Test is done using SPSS, and the results of analysis can be seen in the following table:

Table6. The mean learning outcome before and after applying PBL with Intergated Case Study

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	before	77.05	45	8.440	.915
	after	84.00	45	5.962	.647

Paired samples statistics table is used to figure out the extent of students' mean learning outcome before and after the application of teaching and learning method. Based on the analysis results, it is found that the students' mean score before treatment is given is 77.05, and after the treatment is given it increases to 84.00.

Table 7. Correlation Before and After Treatment

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	before & after	45	.179	.101

Paired Sample Correlations table is used to find out the extent of correlation among variables. In this research, the Paired Sample Correlations is used to figure out the extent of correlation before and after the method is applied. The correlation before and after treatment is 0.179 or 17.9%.

Table 8. Effects of the Use of PBL Method with Integrated Case Study

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	before - after	-6.953	9.422	1.022	-8.985	-4.921	-6.803	44	.000

The paired samples test table is used to find out whether or not the method used has significant influence in increasing students' learning outcomes. Whether there is an influence or not it can be seen in *sig (2-tailed)* column; if the *sig (2-tailed) value* <0.05, then it is significant or there is some influence. The table above shows that the *sig 2-tailed* value is 0.000 < 0.05, hence it can be said that the Problem-Based Solving teaching and learning method with Integrated Case Study influences students learning outcomes.

9. CONCLUSION

Based on the results discussed above, it can be concluded that currently the teaching and learning with *teacher-*

centric model (centered on lecturers) has experienced a shift and replaced with a teaching and learning centered on students instead or commonly known as *student-centered learning (SCL)*. Therefore, there is a need to develop a teaching and learning module which can help lecturers in administering their teaching and learning process. Many teaching and learning models centering on students are available, and one of these SCL approach is Problem-Based Learning (PBL). Based on the analysis results as elaborated earlier, the use of *Problem-Based Learning* module in Economic Statistics II course is found capable of significantly improving students' learning outcomes as compared to when the Problem-Based Learning-based Economic Statistics II Module is not used.

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